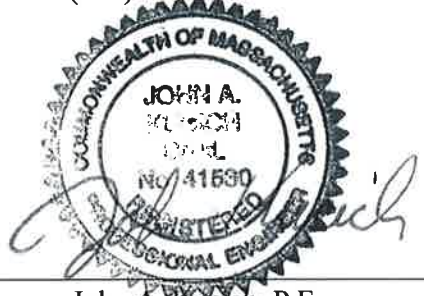
DRAINAGE REPORT

For
Proposed Restaurant

1080 Kings Highway
Map 125, Lot 29
City of New Bedford
Bristol County, Massachusetts

Prepared by:

BOHLER ENGINEERING
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900 TEL.



John A. Kucich, P.E.
Massachusetts P.E. Lic. # 41530

BOHLER
ENGINEERING

August 12, 2015
Revised: September 15, 2015

BEPC #W142005

TABLE OF CONTENTS

APPENDICES

I. PROJECT SUMMARY

The proposed project involves the demolition of the existing approximately 5,145 square foot McDonald's and construction of a 4,450± square foot McDonald's. Additional proposed improvements include the addition of side-by-side ordering stations, increased landscaping, decreased impervious area (±4,625 SF reduction), new utilities, and a drainage system which includes the addition of water quality treatment where none exists currently.

A comparison of the peak existing and proposed conditions runoff rates for the 2, 10, 25 & 100 year storms using the Rational Formula demonstrates that the decrease in impervious area will result in a decrease in peak runoff rates (please refer to calculations in Appendix B):

Existing Flows:

Q_2: 2.95 cfs

Q_{10}: 4.17 cfs

Q_{25}: 4.86 cfs

Q_{100}: 6.08 cfs

Proposed Flows:

Q_2: 2.73 cfs; decrease = 0.22 cfs

Q_{10}: 3.86 cfs; decrease = 0.31 cfs

Q_{25}: 4.50 cfs; decrease = 0.36 cfs

Q_{100}: 5.62 cfs; decrease = 0.46 cfs

II. EXISTING SITE CONDITIONS

The proposed project site is the existing McDonald's Restaurant located in the northerly part of King's Plaza at 1080 Kings Highway in New Bedford. The parcel is approximately 3.9 acres in area and is further defined as assessor's map 125, lot 29. The Site currently drains via sheet flow over the parking lot from West to East, which eventually flows to a wetland. The wetland is located outside of the Site, between the Site property line and the railroad tracks to the Southeast. Portions of the proposed project fall within 100-feet of the off-site wetlands. The wetland delineation was approved under ANRAD Application SE49-664, which is still valid. For reference, Appendix E provides a copy of the ANRAD plan.

III. PROPOSED SITE CONDITIONS

The proposed project involves the demolition of the existing approximately 5,145 square foot McDonald's and construction of a 4,450± square foot McDonald's. Additional proposed improvements include the addition of side-by-side ordering stations, increased landscaping, decreased impervious area (±4,625 SF reduction), new utilities, and a drainage system which includes the addition of water quality treatment where none exists currently. Stormwater treatment will be improved by increasing pervious area within the Site and also by adding a stormwater quality unit. Indirect impacts from stormwater discharges are to be mitigated through the use of sedimentation and erosion control measures during construction and implementation of stormwater Best Management Practices that comply with DEP standards. The stormwater management system will meet all applicable requirements of the current Massachusetts Department of Environmental Protection Stormwater Policy Handbook guidelines as further detailed below.

IV. MASSACHUSETTS DEP STORMWATER MANAGEMENT STANDARDS

The following section describes the project's conformance with the Massachusetts DEP's current Stormwater Management Standards.

Low Impact Development (LID) Measures

The amount of impervious area under proposed conditions will be roughly 4,625 SF less than existing conditions.

Standard #1: **No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.**

The project will not result in any new direct discharge of untreated stormwater into, or cause erosion of wetlands or waters of the Commonwealth.

Standard #2: **Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.**

Runoff rates for the post-development conditions were calculated for the 2-year, 10-year, 25-year and 100-year 24-hour storm events. These are provided in the stormwater pre and post development peak rate calculations in Appendix B. As summarized in this report, post-development peak discharge rates will be less than existing rates.

Standard #3: **Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low**

impact development techniques, stormwater best management practices, and good operation and maintenance.

The amount of impervious area under proposed conditions will be roughly 4,625 SF less than existing conditions.

Standard #4: **Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS)**

The proposed Best Management Practices for this site provides for 81% TSS removal. This is a substantial increase from the 0% removal efficiency the site currently receives. The proposed drainage system meets the 80% TSS removal required.

Standard #5: **For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.**

The proposed project is considered a land use with "Higher Potential Pollutant Loads (LUHPPL)," and as such has been designed in accordance with the Massachusetts Stormwater Management regulations. Stormwater BMPs include stormwater quality unit. A long-term pollution prevention plan has been developed for this project (see Appendix D).

Standard #6: **Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.**

The site does not contain, nor directly discharge to any critical areas, as defined by the Department of Environmental Protection.

Standard #7: **A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable**

The project is a redevelopment project and meets the Stormwater Management Standards to the maximum extent practicable.

Standard #8: **A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.**

An erosion and sediment control plan has been developed for this project implementing at a minimum: silt fence, a crushed stone construction exit, inlet protection, a temporary rock check dam, and provisions for stabilizing disturbed areas. Registration of the site under the NPDES Construction General Permit will be done prior to construction, as necessary.

Standard #9: **A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.**

An Operation and Maintenance Plan developed in accordance with the Stormwater Management Standards is provided in Appendix C of this report.

Standard #10: **All illicit discharges to the stormwater management system are prohibited.**

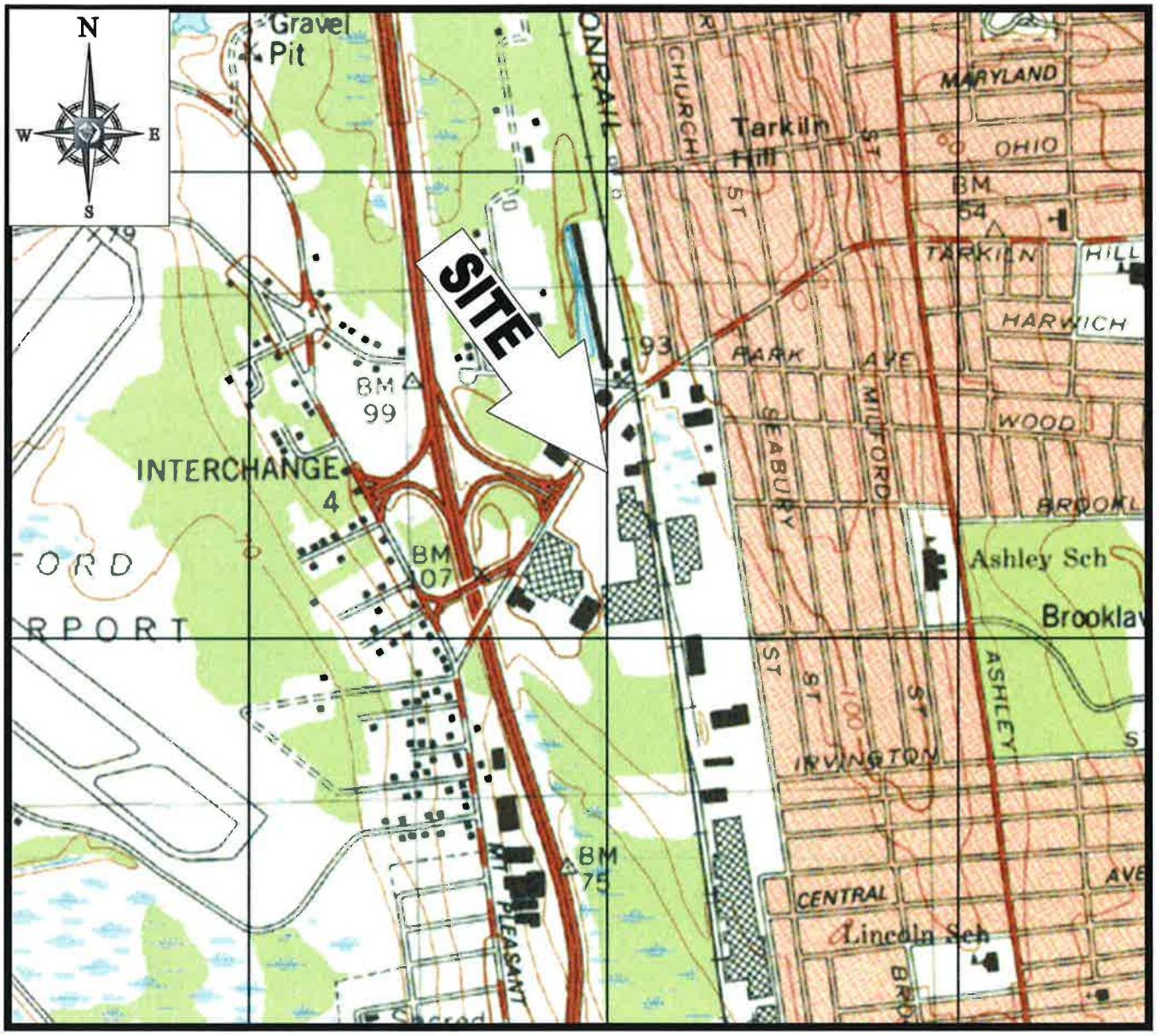
The proposed stormwater system will convey only stormwater and allowable non-storm discharges (firefighting water, landscape irrigation, air conditioning condensate, etc.) and will not contain any illicit discharges from prohibited sources.

V. SUMMARY

The existing Site currently sheet flows over the parking lot to an area which eventually flows to a wetland. In an effort to substantially increase stormwater treatment, the proposed design captures the majority of the surface flow and will treat the stormwater via a stormwater quality unit prior to discharging to existing drainage system for the plaza. The total peak runoff rates for the post-development rates will be less than the pre-development rates. Water quality BMPs at the site will be in accordance with Massachusetts DEP Stormwater Management requirements, and will incorporate the use of a stormwater quality unit. The proposed Best Management Practices for this site provides for 81% TSS removal, which is a substantial improvement over the existing 0% removal efficiency the site currently receives. The project meets or exceeds the applicable stormwater management requirements, and therefore, it is anticipated that this project will have no adverse impacts on the surrounding environment.

APPENDIX A

USGS & FEMA MAPS



LOCATION MAP

SCALE: 1"=1000'
PLAN REFERENCE: USGS NEW BEDFORD NORTH QUADRANGLE

MAP SCALE 1" = 500'

250 0 500 1000 FEET METE

NFIP

PANEL 0387F

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

BRISTOL COUNTY, MASSACHUSETTS

(ALL JURISDICTIONS)

PANEL 387 OF 550

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
NEW BEDFORD, CITY OF	255216	0387	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25005C0387F

EFFECTIVE DATE
JULY 7, 2009

Federal Emergency Management Agency

APPENDIX B

PRE / POST RUNOFF CALCULATIONS & TSS REMOVAL CALCULATIONS

W142005
Calculated by BPB
Date: 9/15/15

Pre and Post Development Rational Formula Calculations

Pre-Development "c" = $\frac{6{,}244 \times 0.3 + 39{,}745 \times 0.9}{45{,}989}$ = 0.819

Post-Development "c" = $\frac{10{,}867 \times 0.3 + 35{,}122 \times 0.9}{45{,}989}$ = 0.758

Q = ciA Where A = 1.06 Ac , c = 0.819 | 0.758

i_2 = 3.4 in/hr

i_{10} = 4.8 in/hr

i_{25} = 5.6 in/hr

i_{100} = 7.0 in/hr

	Pre	Post
Q_2 =	2.95 cfs	2.73 cfs
Q_{10} =	4.17 cfs	3.86 cfs
Q_{25} =	4.86 cfs	4.50 cfs
Q_{100} =	6.08 cfs	5.62 cfs

Water Quality Flow

SWQU 1:

Q = (qu)(A)(WQV)

A = 31,740 SF x $\frac{1 \text{ Ac}}{43{,}560 \text{ SF}}$ x $\frac{1 \text{ mi}^2}{640 \text{ Ac}}$ = 0.00114 Ac

WQV = 1"

Q = 773 x 0.00114 x 1.0

qu = 773

Q = 0.880 cfs

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: CB-1,2,3,4, & 5 TO SWQU-1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.75**	**0.75**	**0.56**	**0.19**
	0.00	**0.19**	**0.00**	**0.19**
	0.00	**0.19**	**0.00**	**0.19**
	0.00	**0.19**	**0.00**	**0.19**

Total TSS Removal = **81%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 1080 King Highway New Bedford
Prepared By: Brandon Barry
Date: 9/15/2015

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

APPENDIX C

LONG TERM STORMWATER SYSTEM OPERATION AND MAINTENANCE PLAN

LONG TERM STORMWATER SYSTEM OPERATION AND MAINTENANCE PLAN

Owner: Cedar-Kings LLC
44 South Bayles Avenue
Port Washington, NY 11050

General Contractor: TBD

Lessee: McDonald's USA, LLC
690 Canton Street
Westwood, MA 02090

The General Contractor shall have all logs and reports as stated within the Stormwater Pollution Prevention Plan readily available at all times for inspection by City's agents.

Method of recording for future Owners

- ☐ Deed
- ☐ Order of Conditions
- ☒ Other: Approved Site Plans

DRAINAGE SYSTEM

COMPONENT: Stormwater Quality Unit

RESPONSIBILITY:
During Construction: General Contractor
Post Construction: Owner

ACTION: Inspection / cleaning

FREQUENCY: Per Manufacturer's Maintenance Guidelines or once per six months whichever is more restrictive.

DESCRIPTION: See Manufacturer's Maintenance Guidelines. All accumulated materials shall be disposed of in accordance with DEP regulations.

BUDGET: Inspection/cleaning- $1,000/ yr per unit

COMPONENT: Catch Basin

RESPONSIBILITY:
During Construction: General Contractor
Post Construction: Owner

ACTION: Cleaning (Sediment removal / sump cleaning) and Inspection

FREQUENCY:
1. Inspection –Two times per year
2. Cleaning – Once per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom invert of the lowest pipe in the basin.

DESCRIPTION: Basins are to be cleaned on an annual basis or when the depth of deposits is greater than or equal to one half the depth from the bottom of the sump to the invert of the lowest pipe in the basin. The Owner will inspect sumps post construction a minimum of twice per year. Precautions shall take place to maintain the integrity of the oil trapping hoods during cleaning. The hoods shall be inspected and repaired as necessary. Accumulated hydrocarbons shall be collected separately from accumulated sediment. All material shall be disposed of in accordance with DEP regulations.
Inspections:
- Frame and Grate
- Inlet and Outlet condition
- Cracks and settlement
- Joint failure
- Leaking
- Sediment Accumulation
- Oil/Gas Sheen in water
- Condition of trap hood
- General inspection of structure

BUDGET: Inspection/cleaning- $1,000/ yr per catch basin for semi-annual inspections and annual cleaning.

CONSTRUCTION ACTIVITY FORM

NOTE: The contractor is responsible for maintaining an accurate and complete log of construction activities, including, but not limited to, commencement of stabilization, major grading activities, timeframes when construction ceases on a portion of site (temporary or permanent) until the Notice of Termination (NOT) is filed.

MAJOR STABILIZATION AND GRADING ACTIVITIES

Construction Activity	Contractor Name	Start Date	End Date	Location

POST CONSTRUCTION ACTIVITY FORM

NOTE: The contractor is responsible for maintaining an accurate and complete log of construction activities, including, but not limited to, commencement of stabilization, major grading activities, timeframes when construction ceases on a portion of site (temporary or permanent) until the Notice of Termination (NOT) is filed.

MAJOR STABILIZATION AND GRADING ACTIVITIES

Construction Activity	Contractor Name	Start Date	End Date	Location

APPENDIX D

LONG-TERM POLLUTION PREVENTION PLAN

Long-Term Pollution Prevention Plan

Proposed Restaurant

1080 Kings Highway

New Bedford, Massachusetts

1. Good Housekeeping Practices

The Owner/Operator shall use good housekeeping practices by following the Operation and Maintenance plans as provided within this report.

2. Provisions for storing materials and waste products inside or under cover

Hazardous materials or wastes are not expected to be stored at the site. Any such materials or wastes will be stored and handled in accordance with all applicable local, state, and federal regulations. In the event of a significant spill of any hazardous material or waste, emergency contact numbers are listed below.

3. Vehicle washing controls

Vehicle washing is not anticipated to occur at this site.

4. Requirements for routine inspections and maintenance of stormwater BMPs

The Owner/Operator shall maintain the BMP's by following the Operation and Maintenance Plan.

5. Spill prevention and response plan

There is very limited risk of significant spills at this site. Any spill requiring action would most likely be associated with motor vehicles. In the event of a large spill contact the following:

Mass DEP 24 hour Spill Emergency Response Notification line: 888-304-1133.

Regulatory Contacts

Contact information for reporting oil and hazardous materials releases to the EPA, DEP, and local agencies are provided below.

Agency	Telephone
Fire Department	911 / 978-983-8940
Massachusetts Department Of Environmental Protection	888-304-1133
United States Environmental Protection Agency	(617) 918-1279

6. Provisions for maintenance of lawns, gardens, and other landscaped areas

The use of chemical fertilizers shall be minimized or avoided where possible.

7. Requirements for storage and use of fertilizers, herbicides, and pesticides

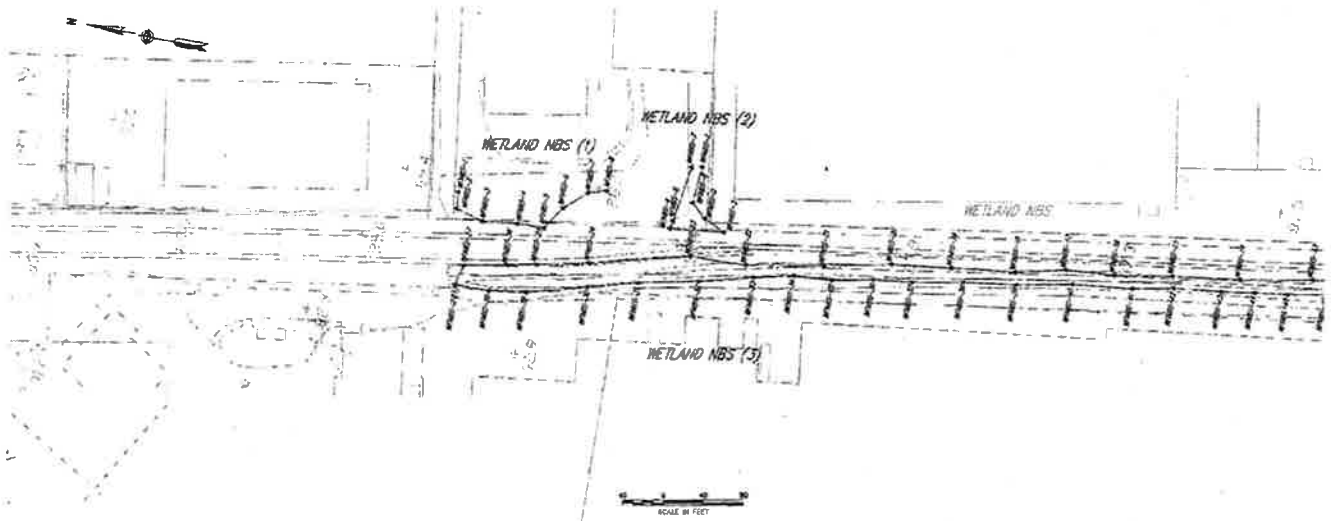
Fertilizers, herbicides, and pesticides will not be stored at the site.

8. Provisions for solid waste management

All solid waste management systems shall be inspected and maintained in accordance with all local, state and federal requirements.

APPENDIX E

ANRAD APPLICATION SE49-664 PLAN



GENERAL NOTES

1. PROPERTY LINES ARE FROM ASSESSORS MAPS AND VALUATION PLANS AND ARE APPROXIMATE ONLY
2. WETLAND DEMARCATION IS DERIVED FROM FIELD LOCATION OF WETLAND FLAGS. SURVEYED IN APRIL–OCTOBER 2010
3. ELEVATIONS ARE BASED ON NGVD 1929 DATUM
4. TOPOGRAPHY PERFORMED BY MINUTEMAN MAPPING, INC., SEE AERIAL PHOTOGRAPHY NOTES
5. 100-YR FLOODPLAIN BOUNDARIES BASED ON FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAPS
6. 100-YR FLOODPLAIN, WHERE IT EXISTS ABOVE BORDERING VEGETATED WETLANDS IS REGULATED AS BORDERING LAND SUBJECT TO FLOODING
7. 100-YR FLOODPLAIN, WHERE IT EXISTS ABOVE COASTAL BANK IS REGULATED AS LAND SUBJECT TO COASTAL STORM FLOWAGE

AERIAL PHOTOGRAPHY NOTES

1. FROM DATE, APRIL 01, 2008
2. COMPILATION DATE: AUGUST–DECEMBER 2008
3. GROUND CONTROL BY COLER & COLANTONIO, INC.
4. ANY USER SHOULD DETERMINE THE SUITABILITY OF THIS AERIAL MAPPING FOR HIS INTENDED USE AND ASSUME ALL RISK AND LIABILITY IN CONNECTION THEREWITH
5. BUILDING CORNERS AS SHOWN REPRESENT ROOF LINES AS COLLECTED FROM AERIAL PHOTOGRAPHY.
6. CONTOUR INTERVAL 5

LEGEND

BF	BANK FLAG
WF	WETLAND FLAG
	WETLANDS
	WETLAND DELINEATION
	200' RIVERFRONT AREA
	25' RIVERFRONT AREA
	100-YEAR FLOODPLAIN
	EDGE OF PAVEMENT
	TOWN LINE
	PROPERTY LINE
	RIGHT OF WAY

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
SOUTH COAST RAIL
COMMUTER RAIL EXTENSION PROJECT

NEW BEDFORD MAIN LINE
RESOURCE AREA DELINEATION
TOWN OF NEW BEDFORD

APPENDIX F

STORMCEPTOR SUPPORTING INFORMATION

Stormceptor®

TECHNICAL SHEET

Stormceptor has TARP covered

TARP Tier I Approval Verifies Stormceptor's Superior Performance

What is TARP?

TARP (Technology Acceptance and Reciprocity Partnership) was established in 2000 as a standardized method of evaluating the performance of stormwater treatment technologies.

The TARP program is a three-tiered process that includes rigorous laboratory testing, field tests and regulatory permits. TARP standards are currently recognized by eight participating states - New Jersey, California, Illinois, Maryland, Massachusetts, New York, Pennsylvania and Virginia.

What does TARP do?

TARP's certification program provides scientific data on stormwater technologies and related performance claims, which helps:

- Regulators and engineers make sound decisions when addressing stormwater treatment needs.
- Spread technology performance data quickly, giving jurisdictions an opportunity to better meet their water quality objectives.

How was Stormceptor recognized by TARP?

In February 2005, Stormceptor received TARP Tier I interim certification from the New Jersey Department of Environmental Protection (NJDEP), verifying Stormceptor's ability to perform beyond normal operational capacity during extreme rainfall.

What does TARP test for?

TARP Tier I focused on the removal of total suspended solids (TSS) and scour testing under various operating rates and sediment loadings. Seven stormwater treatment technologies were tested, including the Stormceptor System.

Particle Size Distribution (PSD) testing

Stormceptor was one of only two units tested to utilize the NJDEP PSD testing – treating a sample of particles between one and 1,000 microns. Instead of following TARP standards, the other technologies opted to test a preferred particle size range that best suited their unit's performance (see TARP Tier I – Hydrodynamic Comparison Results) – testing coarser, larger particles that are easier to remove.

Of the devices tested, Stormceptor removed the broadest range of pollutants.

Total Suspended Solids (TSS) removal efficiency

TARP protocol required testing at varying TSS concentrations – 100 mg/L, 200 mg/L, 300 mg/L, with the unit filled to 50% of the recommended capacity before maintenance.

How did Stormceptor perform?

Of all the technologies tested, Stormceptor recorded the highest TSS removal while removing a significant portion of clay and fine silts (NJDEP PSD).

Stormceptor:	75% TSS removal, tested with NJDEP fine PSD
High Efficiency CDS:	73.7%, tested with a much coarser PSD than NJDEP PSD
Downstream Defender:	70%, tested with sand particles
VortSentry:	69%, tested with sand particles
Vortechs:	64%, tested with a much coarser PSD than NJDEP PSD
Aquaswirl:	60%, tested with sand particles
BaySaver:	51%, tested with NJDEP fine PSD

Not only did Stormceptor record the highest TSS removal, it did so removing NJDEP's specified PSD, meaning it removed both a higher percentage as well as a broader range of particles than the other technologies.

Scour test results

Stormceptor was one of only two technologies that completed the scour test as mandated by NJDEP. **Tests demonstrated Stormceptor did not scour with the unit loaded to design capacity.**

The calm *during* the storm

Stormceptor removes more pollutants from stormwater than any other separator. Stormceptor does not scour as the flow rate increases, maintaining a continuous positive treatment of suspended solids. Stormceptor is designed to remove a wide range of particles, as well as free oils, heavy metals and nutrients that attach to fine sediment. Units can also be designed to remove a specific particle size distribution.

With over 18,000 units operating worldwide, Stormceptor protects waterways every day in every storm.

To learn more, please visit **www.imbriumsystems.com**

TARP TIER I - Hydrodynamic Comparison Results[1]

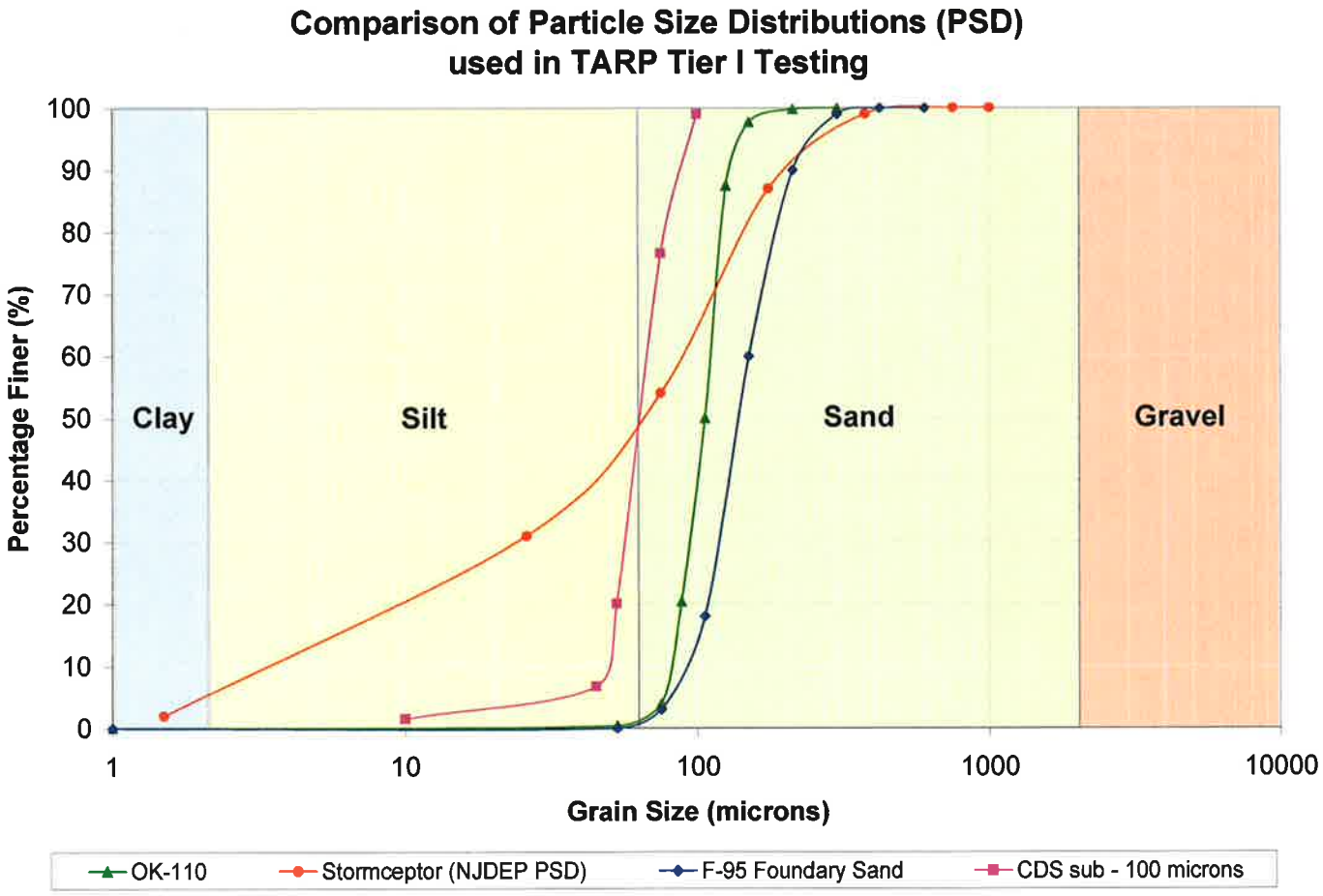
DESCRIPTION			Stormceptor	High Efficiency CDS	Downstream Defender	VortSentry	Vortechs	Aquaswirl	Baysaver System
MODEL TESTED		Model ID	**STC 900**	New Design: PMSU20_20_6 (tank diameter incr. by 1 foot, diff. baffle arrangement)	4-FT	VS40	Model 2000	AS-3	1K
		Treatment Chamber Diameter (ID)	**6 ft**	6 ft	4 ft	4 ft	4 ft	2.5 ft	2 ft
		Marketed Water Quality Peak Flow Treatment Capacity	**n/a [2]**	1.1 cfs (31.1 L/s)	3.0 cfs (85 L/s)	1.1 cfs (31.1 L/s)	2.8 cfs (79.3 L/s)	1.8 cfs (51 L/s)	2.4 cfs (68 L/s)
		100% Operating Rate Tested	**0.64 cfs (18 L/s)**	1.1 cfs (31.1 L/s)	1.1 cfs (31.1 L/s)	1.1 cfs (31.1 L/s)	1.12 cfs (32 L/s) **(40 % of Original)**	0.9 cfs (30.6 L/s) **(60 % of Original)**	1.1 cfs (31 L/s) **(46 % of Original)**
		Original Physical Design Tested	**YES**	**NO** (New Design: Increased Tank Volume & Changed Baffle Arrangement)	YES	YES	YES	YES	YES
NJCAT VERIFICATION	PARTICLE SIZE USED	Used NJCAT Specified PSD	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**	YES
		PSD Range	**NJCAT PSD Tested**	~0-100 µm (i.e. fines washed out of sediment samples used via plankton nets)	53 - 300 µm	53 - 300 µm	38 - 75 µm	50 - 150 µm	NJCAT PSD Tested
		PSD Name		**sub-100 PSD**	**F-95 Sand**	**F-95 Sand**		**OK-110**	
			Refer to Particle Size Distribution (PSD) Chart for details & differences between the distributions used						
	TSS REMOVAL RESULTS	100% Operating Rate Tested	**YES**	YES	YES	YES	**NO** (Up to **40%** of operating rate tested)	**NO** (Up to **60%** of operating rate tested)	**NO** (Up to **46%** of operating rate tested)
		125% Operating Rate Tested	**YES**	**NO**	YES	YES	**NO**	**NO**	**NO**
		Pre-loaded unit at 50% Sediment Capacity prior to evaluating performance	**YES**	**NO**	**NO**	YES	**NO**	**NO**	YES
		NJCAT Verification For TSS Removal	**75 % TSS** (up to 125% of operating rate)	**73.7 % TSS** (up to 130% of operating rate)	**70 % TSS** (up to 125% of operating rate)	**69 % TSS** (up to 125% of operating rate)	**64 % TSS** (up to **40%** of operating rate)	**60 % TSS** (up to **60%** of operating rate)	**51 % TSS** (up to **46%** of operating rate)
	SCOUR TEST RESULTS	Scour Test Performed	**YES**	**NO**	**NO**	YES	**NO**	**NO**	**Yes - in second chamber only**
		50% Sediment Loading Capacity at 125% Operating Rate	**NO SCOUR** **0 ppm**	**Not Tested**	**Not Tested**	NO SCOUR 0 ppm	**Not Tested**	**Not Tested**	SCOUR 11 ppm
		100% Sediment Loading Capacity at 125% Operating Rate (Level were maintenance is recommended)	**NO SCOUR [3]** **3 ppm**	**Not Tested**	**Not Tested**	SCOUR 8 ppm	**Not Tested**	**Not Tested**	SCOUR 16 ppm
TARP TIER I NJDEP INTERIM APPROVAL		NJDEP Accepted NJCAT Verified Value for TSS Removal	**Interim Approval set at 50% TSS**	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS
		Original Design Approved by NJDEP	**YES**	**NO** Only the "new" high efficiency design can be used. Original CDS design not approved.	YES	YES	**NO** Must reduce original flow capacity marketed in literature by 60%.	**NO** Must reduce original flow capacity marketed in literature by 50%.	**NO** Must reduce original flow capacity marketed in literature by 54%; Must increase tank surface area by 44% to 79% for design safety.

1. The Technology Acceptance and Reciprocity Partnership (TARP) is a workgroup of the Environmental Council of States (ECOS) that was originally made up of California, Illinois, Maryland, Massachusetts, New Jersey, New York, Pennsylvania and Virginia. Source of all NJDEP & TARP documented information: www.state.nj.us/dep/dsr/bscit/CertifiedMain.htm .

2. Stormceptor is marketed and designed to achieve water quality objectives, rather than sizing primarily for flow-based criteria.

3. Indicated in the NJDEP interim-certification letter (Feb. 15, 2005) which can be obtained from the below web link, Stormceptor did not scour at a 125% operating rate and 100% unit sediment loading. 3 ppm is considered to be within the tolerance of the testing error.

For NJDEP Interim Certified Stormwater Technologies go to: **http://www.state.nj.us/dep/dsr/bscit/CertifiedMain.htm**



TIER I - Lab Testing Protocol

1. Measure TSS Removal Efficiency

- Influent concentrations: 100, 200, 300 mg/L
- Five operating rates (25, 50, 75, 100, 125%)
- 50% pre-loaded with sediment

2. Measure Scouring / Re-suspension

- 50% and 100% pre-loaded at 125% operating rate

3. Utilize Pre-defined NJDEP Particle Size Distribution

- 5% clay / 40% silt / 55% sand

Source of all NJDEP and TARP documented information, go to: http://www.state.nj.us/dep/dsr/bscit/CertifiedMain.htm

Rinker MATERIALS™

THE STORMCEPTOR® SYSTEM

Owner's Manual

Stormceptor® Owner's Manual Contents

Rev. 3/2006

Thank You!

We want to thank you for selecting the Stormceptor System to use in your efforts in protecting the environment. Stormceptor is one of the most effective and maintenance friendly storm water quality treatment devices available. If you have any questions regarding the operation and maintenance of the Stormceptor System, please call your local Rinker Materials representative, or the Stormceptor Information Line at (800) 909-7763.

1. *Stormceptor Overview*

The Stormceptor System is a water quality device used to remove total suspended solids (TSS) and free oil (TPH) from storm water run-off. Stormceptor takes the place of a conventional manhole or inlet structure within a storm drain system. Rinker Materials manufactures the Stormceptor System with precast concrete components and a fiberglass disc insert. A fiberglass Stormceptor can also be provided for special applications.

The Stormceptor System product line consists of four patented designs:

- The In-Line (Conventional) Stormceptor, available in eight model sizes ranging from 900 to 7200 gallon storage capacity.
- An In-Line (Series) Stormceptor is available in three model sizes ranging from 11,000 to 16,000 gallon storage capacity.
- The Submerged Stormceptor, an in-line system designed for oil and sediment removal in partially submerged pipes, available in all models sizes ranging from 450*i* to 16,000 gallon storage capacity.
- The Inlet Stormceptor is a 450 gallon unit designed for small drainage areas.

Stormceptor removes free oil and suspended solids from storm water preventing hazardous spills and non-point source pollution from entering downstream lakes and rivers. Rinker Materials and its affiliates market and manufacture the Stormceptor System in the United States and Australia. Several thousand Stormceptor Systems have been installed in various locations throughout North America, Australia and the Caribbean since 1990.

In the Stormceptor, a fiberglass insert separates the treatment chamber from the by-pass chamber. The different insert designs are illustrated in Figures 1 and 2. These designs are easily distinguishable from the surface once the cover has been removed.

There are four versions of the in-line disc insert: single inlet/outlet, multiple inlet, in-line series insert and submerged designs. In the non-submerged "disc" design you will be able to see the inlet pipe, the drop pipe opening to the lower chamber, the weir, a 6" oil inspection/cleanout pipe, a large 24" riser pipe opening offset on the outlet side of the structure, and the outlet pipe from the unit. The weir will be around the 24" outlet pipe on the multiple inlet disc insert and on large diameter pipe applications.

The STC (series) Stormceptors consist of two chambers comprised of similar fiberglass inserts. These units also contain a 6" oil/inspection cleanout pipe and 24" outlet riser pipes.

The submerged disc insert has a higher weir and a second inlet drop pipe. In the inlet design you will be able to see an inlet drop pipe and an outlet riser pipe as well as a central oil inspection/cleanout port.

2. *Stormceptor System Operation*

The Stormceptor consists of a lower treatment chamber, which is always full of water, and a by-pass chamber. Storm water flows into the by-pass chamber via the storm sewer pipe or grated inlet (Inlet Stormceptor). Normal flows are diverted by a weir and drop pipe arrangement into a treatment chamber. Water flows up through the submerged outlet pipe based on the head at the inlet weir and is discharged back into the by-pass chamber downstream of the weir. The treated storm water continues down stream via the storm sewer system.

Oil and other liquids with a specific gravity less than water rise in the treatment chamber and become trapped under the fiberglass insert. Sediment will settle to the bottom of the chamber by gravity. The circular design of the treatment chamber is critical to prevent turbulent eddy currents and to promote settling.

During infrequent high flow conditions, storm water will by-pass the weir and be conveyed to the outlet sewer directly. The by-pass is an integral part of the Stormceptor since other oil/grit separators have been noted to scour during high flow conditions (Schueler and Shepp, 1993).

For further details please refer to *The Stormceptor System Technical Manual.*

The key benefits of Stormceptor include:

- Capable of removing more than 80% of the total sediment load when properly applied as a source control for small drainage areas
- Removes free oil from storm water during normal flow conditions
- Will not scour or resuspend trapped pollutants
- Ideal spill control device for commercial and industrial developments
- Vertical orientation facilitates maintenance and inspections
- Small foot print

3. *Identification of Stormceptor*

All In-Line (including Submerged) Stormceptors are provided with their own frame and cover. The cover has the name STORMCEPTOR clearly embossed on it to allow easy identification of the unit. The name Stormceptor is not embossed on the inlet models due to the variability of inlet grates used/approved across North America. You will be able to identify the Inlet Stormceptor by looking into the grate since the insert will be visible.

Once you have located a unit, there still may be a question as to the size of the unit. Comparing the measured depth from the water level (bottom of insert) to the bottom of the tank with Table 1 should help determine the size of the unit.

Table 1. Stormceptor Dimensions*	
Model	**Pipe Invert to Top of Base Slab**
450*i*	60"
900	55"
1200	71"
1800	105"
2400	94"
3600	134"
4800	128"
6000	150"
7200	134"
11000*s*	128"**
13000*s*	150"**
16000*s*	134"**

* *Depths are approximate*

** *Depths per structure*

Starting in 1996, a metal serial number tag has been affixed to the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the Stormceptor using depth measurements, please contact the Rinker Materials Stormceptor information line at (800) 909-7763 for assistance.

4. *Stormceptor Maintenance Guidelines*

The performance of all storm water quality measures that rely on sedimentation decreases as they fill with sediment (See Table 2 for Stormceptor capacities). An estimate of performance loss can be made from the relationship between performance and storage volume. Rinker Materials recommends maintenance be performed when the sediment volume in the unit reaches 15% of the total storage. This recommendation is based on several factors:

- Sediment removal is easier when removed on a regular basis (as sediment builds up it compacts and solidifies making maintenance more difficult).
- Development of a routine maintenance interval helps ensure a regular maintenance schedule is followed. Although the frequency of maintenance will depend on site conditions, it is estimated that annual maintenance will be required for most applications; annual maintenance is a routine occurrence which is easy to plan for and remember.
- A minimal performance degradation due to sediment build-up can occur.

In the event of any hazardous material spill, Rinker Materials recommends maintenance be performed immediately. Maintenance should be performed by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required.

Table 2. Stormceptor Capacities			
Model	**Sediment Capacity ft³ (L)**	**Oil Capacity US gal (L)**	**Total Holding Capacity US gal (L)**
450*i*	45 (1276)	86 (326)	470 (1779)
900	75 (2135)	251 (950)	952 (3604)
1200	113 (3202)	251 (950)	1234 (4671)
1800	193 (5470)	251 (950)	1833 (6939)
2400	155 (4387)	840 (3180)	2462 (9320)
3600	323 (9134)	840 (3180)	3715 (14063)
4800	465 (13158)	909 (3441)	5059 (19150)
6000	609 (17235)	909 (3441)	6136 (23227)
7200	726 (20551)	1059 (4009)	7420 (28088)
11000*s*	942 (26687)	2797 (10588)*	11194 (42374)
13000*s*	1230 (34841)	2797 (10588)*	13348 (50528)
16000*s*	1470 (41632)	3055 (11564)*	15918 (60256)

** Total both structures combined*

4.1 *Recommended Maintenance Procedure*

For the "disc" design, oil is removed through the 6" inspection/cleanout pipe and sediment is removed through the 24" diameter outlet riser pipe. Alternatively, oil could be removed from the 24" opening if water is removed from the treatment chamber, lowering the oil level below the drop pipes.

The depth of sediment can be measured from the surface of the Stormceptor with a dipstick tube equipped with a ball valve (Sludge Judge®). It is recommended that maintenance be performed once the sediment depth exceeds the guideline values provided in Table 3 for the reasons noted in Section 4.0 Stormceptor Maintenance Guidelines.

Table 3. Sediment Depths Indicating Required Maintenance	
Model	**Sediment Depth***
450*i*	8" (200 mm)
900	8" (200 mm)
1200	10" (250 mm)
1800	15" (375 mm)
2400	12" (300 mm)
3600	17" (425 mm)
4800	15" (375 mm)
6000	18" (450 mm)
7200	15" (375 mm)
11000*s*	17" (425 mm)**
13000*s*	20" (500 mm)**
16000*s*	17" (425 mm)**

** Depths are approximate*

*** In each structure*

No entry into the unit is required for routine maintenance of the Inlet Stormceptor or the smaller disc insert models of the In-Line Stormceptor. Entry to the level of the disc insert may be required for servicing the larger disc insert models. Any potential obstructions at the inlet can be observed from the surface. The fiberglass insert has been designed as a platform for authorized maintenance personnel in the event that an obstruction needs to be removed.

Typically, maintenance is performed by the Vacuum Service Industry, a well established sector of the service industry that cleans underground tanks, sewers, and catch-basins. Costs to clean a Stormceptor will vary based on the size of the unit and transportation distances. If you need assistance for cleaning a Stormceptor unit, contact your local Rinker Materials representative, or the Stormceptor Information Line at (800) 909-7763.

Figures 1 and 2 will help illustrate the access point for routine maintenance of Stormceptor.

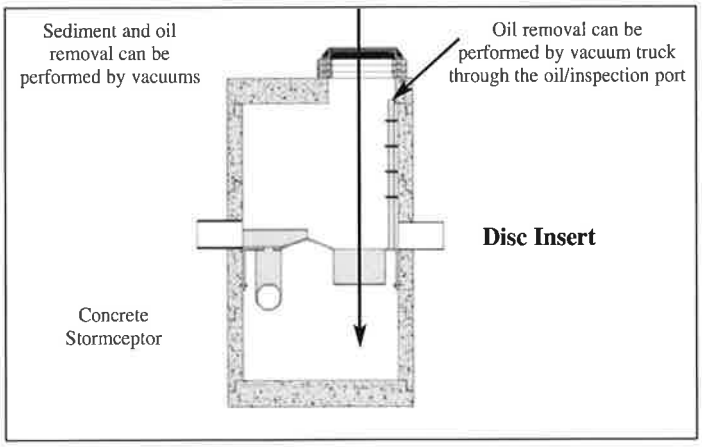


Figure 1 Single Inlet/Outlet "Disc" Insert
In-Line Stormceptor

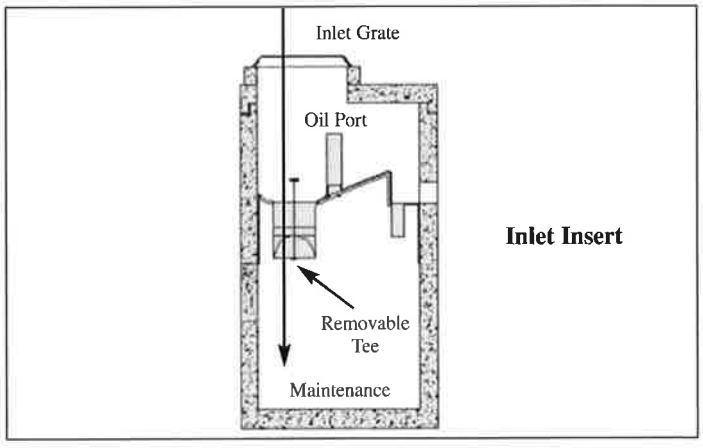


Figure 2 STC 450*i*
Inlet Stormceptor

4.2 *Disposal of Trapped Material from Stormceptor*

The requirements for the disposal of material from Stormceptor are similar to that of any other Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents.

In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. In some areas, mixing the water with the sediment will create a slurry that can be discharged into a trunk sanitary sewer. In all disposal options, approval from the disposal facility operator/agency is required. Petroleum waste products collected in Stormceptor (oil/chemical/fuel spills) should be removed by a licensed waste management company.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (< 10 ppm). Stormceptor will remove over 95% of all free oil and the appearance of a sheen at the outlet with high influent oil concentrations does not mean that the unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

5.0 *Recommended Safety Procedures*

Rinker Materials strongly recommends that any person who enters a Stormceptor System follow all applicable OSHA regulations for entry in permit required confined spaces, as outlined in 29 CFR 1910.146. A permit required confined space consists of a space that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry and exit.
- Is not designed for continuous employee occupancy.
- Contains or has one of the following:
  - a potential to contain a hazardous atmosphere.
  - a material that has the potential for engulfing an entrant.
  - any other recognized serious safety hazard.

Storm water and wastewater systems fall under OSHA guidelines for a permit required confined space. Failure to follow OSHA guidelines for entry and work in a permit required confined space can result in serious injury or death. Please exercise extreme caution and follow appropriate safety procedures when entering any confined space.

Two square pick holes in the cover vent the Stormceptor, allow for removal of the cover, and provide sampling ports for air quality monitoring before the cover is removed. If you must enter the Stormceptor, please note that if the disc insert inside is wet, it can be slippery.

Recognizing that every work site is different, the responsibility for safety falls on the contractor. The contractor must ensure that all employees and subcontractors follow established safety procedures and OSHA regulations for working in and around permit required confined spaces as well as for any other safety hazard that may be present on that particular site.

6.0 *Stormceptor Monitoring Protocol*

If monitoring of your Stormceptor System is required, we recommend you follow the procedures outlined below by the Rinker Materials Stormceptor office. If you have any questions regarding monitoring please contact the Rinker Materials Stormceptor Product Manager at (800) 909-7763.

6.1 *Pollutants to be Monitored*

Table 4 indicates the pollutants to be monitored during the storm events and the minimum acceptable detection limit for each pollutant to be analyzed. Approved federal or state laboratory analysis methodologies are to be used for the analysis.

The optional metals indicated in Table 4 refer to the Resource Conservation Recovery Act and may be covered by a generic metals scan. Bacteria monitoring will not be required unless explicitly requested elsewhere.

Two sediment samples are to be extracted from the monitored Stormceptor at the end of the study and analyzed for the particle size distribution and water content. A minimum of 8 U.S. sieve sizes should be used to determine the particle size distribution. Sieves that are used must include, but are not limited to 35, 60, 100, 140, 200, 270 and 400. Three clay particle sizes must be analyzed to denote particle sizes between 5 and 25 μm. The particle size distributions should be plotted on a standard grain size distribution graph.

Table 4. Monitoring Pollutants	
Pollutant	**Minimum Detection Limit (MDL)**
Total Suspended Solids (TSS)	5 mg/l
Total Phosphorus (P)	0.02 mg/l
Total Kjeldahl Nitrogen (TKN)	0.1 mg/l
Copper (Cu)	0.001 mg/l
Cadmium (Cd)	0.005 mg/l
Lead (Pb)	0.05 mg/l
Zinc (Zn)	0.01 mg/l
Chromium (Cr)	0.01 mg/l
Total Petroleum Hydrocarbons (TPH)	1 mg/l
Conductivity	0.1 μmho/cm
Fecal Coliform*	1/100 ml
Additional Metals (optional)	
Arsenic (As)	0.005 mg/l
Barium (Ba)	0.01 mg/l
Mercury (Hg)	0.0005 mg/l
Selenium (Se)	0.005 mg/l
Silver (Ag)	0.01 mg/l

* Only if explicitly requested in Terms of Reference

6.2 *Monitoring Methodology*

The following monitoring protocol should be followed to ensure reasonable monitoring results and interpretation:

- Monitoring protocols should conform to **EPA 40 CFR Part 136.**
- The **EPA guideline of 72 hours dry period** prior to a monitoring event should be used. This will ensure that there is sufficient pollutant build-up available for wash-off during the monitored event.
- Flow proportional monitoring must be conducted for the parameters indicated in Table 1. Samples should be analyzed separately for the first flush versus the remainder of the storm event. Monitoring need not extend longer than an 8-hour period after the start of the storm event (composite).
- **Sediment sampling** (measuring the sediment depth in the unit at the beginning and end of the monitoring period) must be conducted. The water content of the sediment layer must be analyzed to determine the dry volume of suspended solids. Sediment depth sampling will indicate the rate of pollution accumulation in the unit, provide confirmation that the unit is not scouring and confirm the flow proportional monitoring results. A mass balance using the sediment sampling should be calculated to validate the flow proportional sampling.

- **Grab sampling** (just taking samples at the inlet and outlet) is an unacceptable methodology for testing the performance of the Stormceptor during wet weather conditions unless it is flow weighted (flow weighted composite sample from numerous grab samples) over the entire storm.
- The oil containment area underneath the insert should be inspected via the vent pipe for dry weather spills capture once a month during the monitoring period since the flow rate of a dry weather spill may not trigger the automated samplers.
- A tipping bucket rain gauge should be installed on-site to record the distribution of storm intensities and rainfall volume during the monitored events.
- Results that are within the laboratory error (both inlet and outlet) or are representative of relatively clean water should be discarded. Typical concentrations of pollutants in storm water are:

TSS	100 mg/L
Total P	0.33 mg/L
TKN	1.50 mg/L
Total Cu	34 μg/L
Total Pb	144 μg/L
Total Zn	160 μg/L

A threshold first flush/composite TSS value of 50 mg/L at the inlet to the Stormceptor should be used as the lower limit of an acceptable storm for reporting event efficiency. Monitoring results where the influent TSS concentration is less than 50 mg/L should only be used in mass load removal calculations over the entire monitoring period with other storms where the influent concentration is greater than 50 mg/L. The results should not be analyzed if the influent TSS concentrations during all monitored storms are less than 50 mg/L. Storms where the influent TSS concentration is less than 10 mg/L should be discarded from all analyses.

- A threshold storm event volume equal to 1.5 times the storage volume of the Stormceptor being monitored should be used as the lower limit of an acceptable storm for monitoring.
- Sampling at the outlet of the Stormceptor should be conducted within the 24" outlet riser pipe to accurately define event performance.
- The personnel monitoring the Stormceptor should record incidental information in a log file. Information such as weather, site conditions, inspection and maintenance information, monitoring equipment failure, etc. provide valuable information that can explain anomalous results.
- Laboratory results of monitored samples should be analyzed within 10 days of being submitted to the lab.
- Weekly inspections of the sampling tubes, flow meter, rain gauge, and quality samplers should be conducted to ensure proper operation of the monitoring equipment. Debris and sediment that collects around the sampling intakes should be cleaned after each event.
- During the installation of automated quality samplers, care should be exercised to ensure that representative samples will be extracted (placement of intakes, ensuring that tubing is not constricted or crimped).
- Sampling should be conducted for a minimum of 6 storms. Ideally 15 storms should be sampled if the budget allows.

Call the Stormceptor Information Line (800-909-7763) for more detailed information and test results.

TECHNICAL INFORMATION:

- Stormceptor CD ROM
- Stormceptor Technical Manual
- Stormceptor Installation Guide
- Stormceptor Brochure

TEST RESULTS:

- STEP Report (Independent Verification)
- University of Coventry Study
- ETV Canada (Federal Verification)
- National Water Research Institute Test
- Westwood, MA Field Monitoring Study
- Edmonton, Canada Field Monitoring Study
- Seattle Field Monitoring
- Como Park, MN Field Monitoring Study
- Florida Atlantic University Submerged Stormceptor Testing
- Oil Removal Field Validation
- Sludge Analyses and Particle Size Analyses

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